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QUARTERLY STATUS AND PROGRESS REPORT
FOR PERIOD ENDING MARCH 31, 2003
OTHER TRANSACTION AGREEMENT DTRS56-02-T-0001, SwRI® PROJECT 14.06162
“APPLICATION OF REMOTE-FIELD EDDY CURRENT (RFEC) TESTING
TO INSPECTION OF UNPIGGABLE PIPELINES”

Many pipelines contain internal restrictions that do not allow the passage of inspection pigs that use conventional inspection technology. The purpose of this project is to investigate the feasibility of a remote-field eddy current (RFEC) inspection method that utilizes either a unique collapsible excitation coil or a small rigid excitation coil that can pass through internal pipeline restrictions.

Task 1, Technology Assessment, has been completed. The purpose of this technology assessment was to (1) identify recent developments in RFEC testing that could be relevant to the project, and (2) determine inspection requirements for unpiggable pipelines (e.g., size constraints) that would guide determination of parameters for the RFEC system. The RFEC references most useful to the project dealt with (1) shielding that allowed the exciter-to-receiver spacing to be reduced, (2) effects of coil tilt, (3) improvement in scanning speed using local magnetic saturation, (4) coil design improvements, and (5) use of a small excitation coil to allow passage through restricted areas. It was determined that target pipe sizes for development of a collapsible RFEC system would be in the range of approximately 4 to 22 inches in diameter. Target obstacles to be addressed are reduced port valves (primarily plug valves) and bends with radii smaller than 1.5 inches in diameter. Nonconventional, self-powered, pigging devices (currently under development) are potential platforms for an RFEC system.

Task 2, RFEC Coil Design, is underway. This task involves the modeling and design of RFEC coils to accommodate the size constraints imposed by internal restrictions. A concept for a collapsible excitation coil was developed. This coil consists of six hinged segments that expand to create a full-diameter coil and then retract to accommodate a smaller diameter restriction. Another implementation of the collapsible coil involves folding the coil into two halves to allow passage through plug valves that have openings that are the same as the pipe diameter in one direction, but are narrow in the other direction.

An RFEC computer model developed previously by Southwest Research Institute is currently being used to evaluate the response from the segmented collapsible coil. The outer perimeter of the coil produces the excitation magnetic field; however, the segmented arrangement results in the equivalent of a small-diameter inner coil that produces a field in the opposite direction. This field combines with the main field to reduce the overall field somewhat, but only about 10 percent. This points to the feasibility of using a segmented coil approach.

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